

CLCS

GATEWAY COMMON SERVICES CSCI TO SYSTEM CONTROL CSCI OPS CM CSC INTERFACE DEFINITION DOCUMENT

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Prepared for:

National Aeronautics and Space Administration
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KSC, Florida

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INTERFACE DEFINITION DOCUMENT

Contract

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1.0 – INTRODUCTION

1.1 SCOPE

This Interface Definition Document (IDD) defines the interface specification between the Gateway Common Services CSCI and the System Control CSCI Operational Configuration Manager (OPS CM) CSC, for the Redstone Delivery of the Checkout and Launch Control System (CLCS).

1.2 PURPOSE

The purpose of this document is to establish the interface description between the Gateway Common Services CSCI and the System Control CSCI OPS CM CSC to support the subsystem design and to satisfy the interface requirements. The contents of this IDD shall be binding to all parties involved.

1.3 DOCUMENT ORGANIZATION

This document is organized into three major sections and two appendixes.

1. Section 1.0 introduces and defines the scope and purpose of this document.
2. Section 2.0 lists the parent, applicable, and reference documents of this document.
3. Section 3.0 defines the software-to-software interfaces [non-Application Program Interfaces (API's)] between the Gateway Common Services CSCI and the System Control CSCI OPS CM CSC.
4. Appendix A contains the acronym list.
5. Appendix B contains the document glossary.

2 .0 – RELATED DOCUMENTATION

This section identifies the documents that are related to the contents of this IDD as indicated in the following paragraphs.

2.1 PARENT DOCUMENTS

The parent documents establish the criteria and technical basis for the existence of this document. The parent documents are:

N/A

2.2 APPLICABLE DOCUMENTS

Applicable documents are those documents, of the exact issue shown, whose contents, to the extent specified herein, are considered to form a part of this document. The specified parts of the applicable documents carry the same weight as if they were stated within the body of this document. The applicable documents are:

N/A

2.3 REFERENCE DOCUMENTS

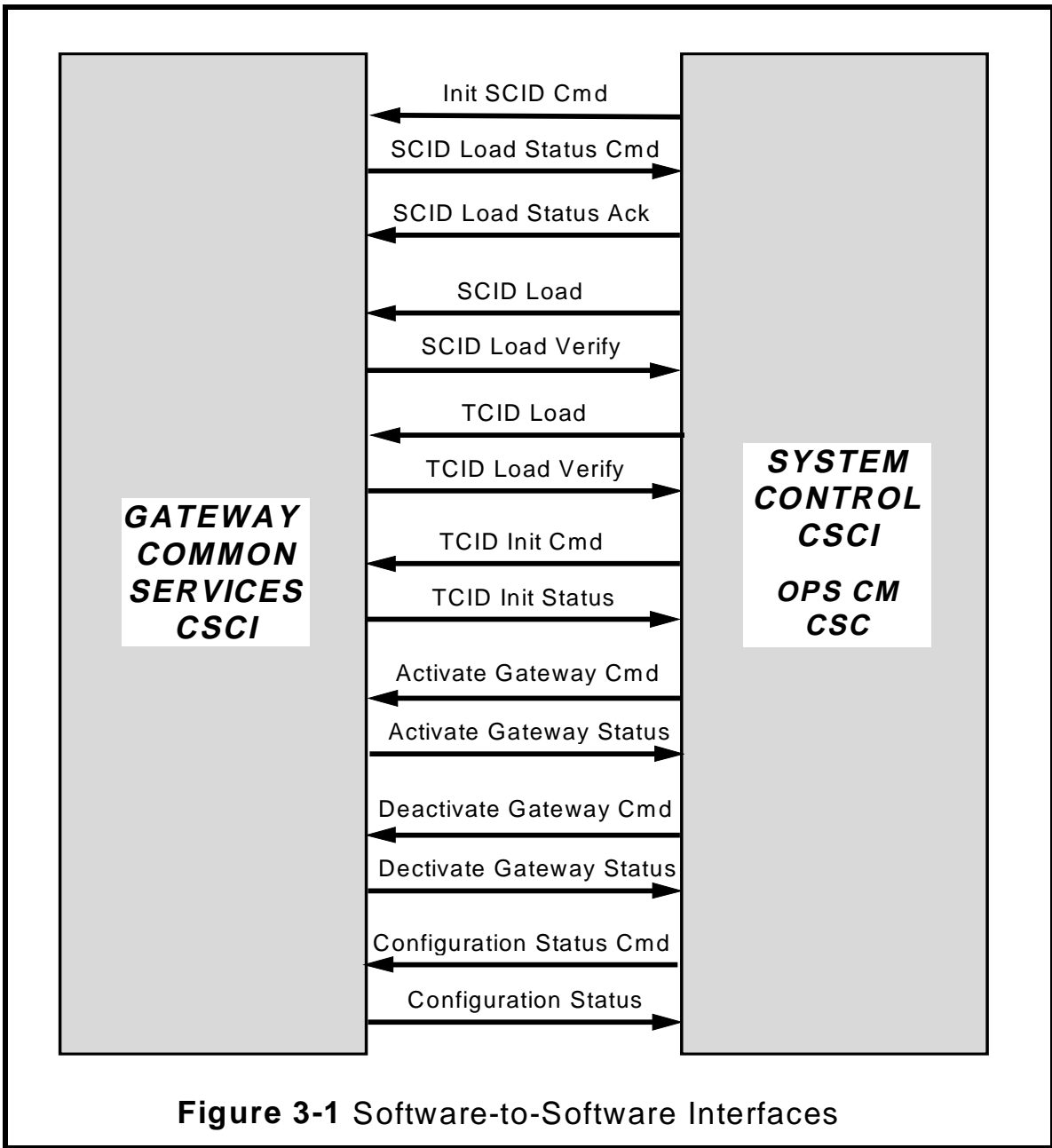
Reference documents are those documents that, although not a part of this document, serve to amplify and clarify its content. The reference documents are:

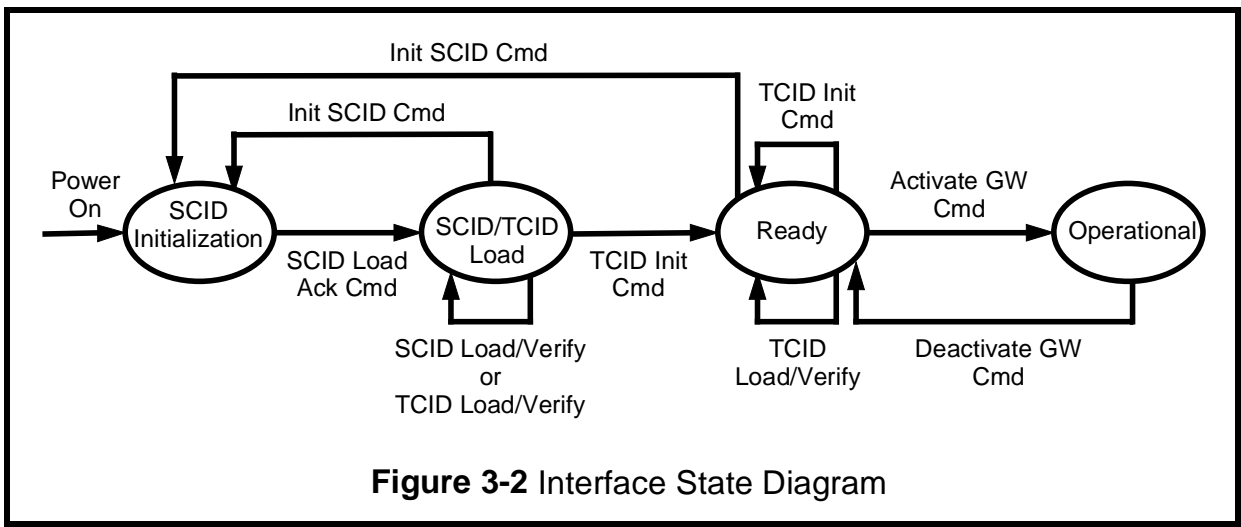
| | |
|-----|---|
| N/A | Redstone Delivery Document |
| TBD | OPS CM DP2 Requirements Document |
| TBD | Gateway Common Services Requirements Document |

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3 .0 – SOFTWARE-TO-SOFTWARE INTERFACE DEFINITIONS

This section provides an overview of the software-to-software interfaces between the Gateway Common Services CSCI and the System Control CSCI OPS CM CSC. Figure 3-1 illustrates an overview of this interface. This interface provides the ability for designated CLCS users to load SCID and TCID baselines onto CLCS gateway platforms and to activate them.





3.1 SCID INITIALIZATION

The gateway always tries to initialize an SCID during its bootup processing. After loading the SCID, the gateway will begin transmitting a cyclic SCID Load Status message. This SCID Load Status message will indicate that the gateway has successfully booted and loaded the SCID application. OPS CM will acknowledge this SCID Load Status message by sending the gateway a SCID Load Acknowledge command. After receiving the SCID Load Acknowledge command, the gateway will cease transmission of the SCID Load Status message.

3.1.1 DATA TRANSFER MECHANISM

The SCID Initialization procedure occurs as follows:

1. A gateway can enter the SCID initialization by either being powered on or by receiving an Initialize SCID command from OPS CM. Upon receiving an Initialize SCID command, the gateway will reboot and initialize the SCID on its local disk. The Initialize SCID command is transmitted via CLM Reliable Multicast using the service name TBD. The Initialize SCID command is used to initialize a newly loaded SCID Build or to move the gateway from the Ready state to the SCID initialization state.
2. After successfully loading the SCID, the gateway begins transmitting a cyclic SCID Load Status command via CLM Reliable Multicast using the service name TBD.

3. OPS CM sends an SCID Load Status Acknowledgment packet to the gateway. This packet is transmitted via CLM Reliable Multicast using the service name TBD.
4. The gateway stops transmitting its SCID Load Status message after receiving the SCID Load Status Acknowledgment.

Note: The Initialize SCID command is only valid when the gateway is in either the SCID/TCID Load state or the Ready state.

3.1.2 TIMING CONSTRAINTS

No timing constraints apply.

3.1.3 DATA FORMATS

3.1.3.1 Initialize SCID Command

The Initialize SCID command will be in the standard CLCS Computer-to-Computer (C-C) packet format. The C-C header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------|-------|
| 1 | Payload Type (C-C type = 1) | 1 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 16 |
| 2 | Transaction ID | TR # |
| 1 | Routing Code | 9 |
| 1 | Request ID | 1 |

The C-C packet payload will contain the following data. All integer data will be in network byte order.

| Bytes | Field Description | Value |
|-------|--------------------|-------|
| 1 | Spare | 0 |
| 1 | Gateway Load SCID | 1 |
| 14 | SCID Name | 0 |
| 16 | TOTAL BYTES | |

3.1.3.2 SCID Load Status Message

The SCID Load Status message will be in the standard CLCS C-C packet format. The C-C header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------|-------|
| 1 | Payload Type (C-C type = 1) | 1 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 1 |
| 2 | Transaction ID | TR # |
| 1 | Routing Code | 9 |
| 1 | Request ID | 5 |

The C-C packet payload will contain the following data. All integer data will be in network byte order.

| Bytes | Field Description | Value |
|-------|-----------------------|--|
| 1 | Initialization Status | 0 = successful 1 = unsuccessful (POST failure) |
| 1 | TOTAL BYTES | |

3.1.3.3 SCID Load Status Acknowledge

The SCID Load Status Acknowledge will be in the standard CLCS C-C response packet format. The response header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------------|-------|
| 1 | Payload Type (response type = 0) | 0 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 0 |
| 2 | Transaction ID | TR # |
| 2 | Transaction ID being responded to | |
| 2 | Completion Code (0=successful) | 0 |

The response packet payload will contain no data.

3.1.4 SPECIAL INSTRUCTIONS

If the gateway is unable to successfully load the SCID software, it will attempt to boot a minimal VxWorks kernel located in its flash memory. Manual intervention will be required to load another SCID.

3.1.5 ERROR CHECKING AND STATUS

OPS CM will detect the following error conditions:

1. SCID Load Status message is not received within 1 minute of transmitting an Initialize SCID command.
2. SCID Load Status message does not cease within 5 seconds of transmitting a SCID Load Acknowledge.

3.1.6 COMMONALITIES

None.

3.1.7 APPLICABLE STANDARDS

None.

3.2 SCID LOAD AND VERIFY

The SCID Load and Verify procedure provides for the loading of the SCID Build files across the RTCN from the OPS CM repository to the local disk on the gateway. The SCID Load is verified by retrieving the files from the gateway and comparing them to the original files. This procedure does not require any interaction with gateway application software.

3.2.1 DATA TRANSFER MECHANISM

The SCID Load and Verify procedure occurs as follows:

1. OPS CM initiates an FTP session with the gateway. It then performs an FTP “put” of the SCID Build files to the gateway’s local disk over the RTCN. The SCID Build files will be placed in the following directory on the gateway: /clcs/scid. This is considered an SCID Load.

2. OPS CM performs a verification of the SCID load by retrieving the loaded files via an FTP “get” and comparing them to the original SCID Build files in the OPS CM repository. If they are the same, the SCID Load was a success. This is considered an SCID Load Verify.

3.2.2 TIMING CONSTRAINTS

No timing constraints apply.

3.2.3 DATA FORMATS

The data formats for the SCID Load and Verify transactions will be compliant with the FTP standard.

3.2.4 SPECIAL INSTRUCTIONS

None.

3.2.5 ERROR CHECKING AND STATUS

OPS CM will detect the following error conditions:

1. FTP connection cannot be established or breaks during the session.
2. SCID Verify fails on the compare of files.

3.2.6 COMMONALITIES

The SCID and TCID Load commands operate with the same procedures.

3.2.7 APPLICABLE STANDARDS

RFC-959 File Transfer Protocol (FTP)

3.3 TCID LOAD, VERIFY AND INITIALIZE

The TCID Load, Verify and Initialize procedure provides for the loading of the TCID Build files across the RTCN from the OPS CM repository to the local disk on the gateway. The TCID Load is verified by retrieving the files from the gateway and comparing them to the original files. This procedure does not require any interaction with gateway application software. Once a TCID Build has been successfully loaded, OPS CM will

send the gateway a TCID Initialize command. This command will cause the gateway to load its TCID tables and move the gateway into the Ready state.

3.3.1 DATA TRANSFER MECHANISM

The TCID Load, Verify and Initialize procedure occurs as follows:

1. OPS CM initiates an FTP session with the gateway. It then performs an FTP “put” of the TCID Build files to the gateway’s local disk over the RTCN. The TCID Build files will be placed in the following directory on the gateway: /clcs/tcid. OPS CM will load only the gateway tables for the specific gateway type being loaded. This is considered a TCID Load. A TCID Load can occur when the gateway is in either the SCID/TCID Load state or the Ready state. Part of the TCID that is loaded will be an activity file created by OPS CM. This file will contain information about the gateway’s activity.
2. OPS CM performs a verification of the TCID Load by retrieving the loaded files via an FTP “get” and comparing them to the original TCID Build files in the OPS CM repository. If they are the same, the TCID Load was a success. This is considered a TCID Load Verify.
3. OPS CM transmits a TCID Initialize command to the gateway. This command is sent via CLM Reliable Multicast using the service name TBD. This command can be used to load an initial TCID while in the SCID/TCID load state or to load another TCID while in the Ready state.
4. Once the TCID tables have been successfully loaded, the gateway will transmit a TCID Initialize Status message to OPS CM. This message is sent via CLM Reliable Multicast using the service name TBD.

3.3.2 TIMING CONSTRAINTS

No timing constraints apply.

3.3.3 DATA FORMATS

3.3.3.1 TCID Load and Verify

The TCID Load and Verify transactions will be compliant with the FTP standard.

3.3.3.2 TCID Initialize Command

The TCID Initialize command will be in the standard CLCS C-C packet format. The C-C header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------|-------|
| 1 | Payload Type (C-C type = 1) | 1 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 16 |
| 2 | Transaction ID | TR # |
| 1 | Routing Code | 9 |
| 1 | Request ID | 1 |

The C-C packet payload will contain the following data. All integer data will be in network byte order.

| Bytes | Field Description | Value |
|-------|--------------------|-------|
| 1 | Spare | 0 |
| 1 | Gateway Load TCID | 2 |
| 14 | TCID Name | 0 |
| 16 | TOTAL BYTES | |

3.3.3.3 TCID Initialize Status

The TCID Initialize Status will be in the standard CLCS response packet format. The response header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------------|-------------------------------|
| 1 | Payload Type (response type = 0) | 0 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 0 |
| 2 | Transaction ID | TR # |
| 2 | Transaction ID being responded to | |
| 2 | Completion Code | 0 = successful 1 = failure |

The response packet payload will contain no data.

3.3.3.4 Activity File

The activity file created and loaded by OPS CM as part of the gateway's TCID will have the following file name: /clcs/tcid/act_data. The contents of the file will have the following format.

| Line # | Field Description | Format | Max. Length |
|--------|-------------------|------------------------------|-------------|
| 1 | Activity Name | Null-terminated ASCII string | 30 |
| 2 | SCID Version | Null-terminated ASCII string | 30 |
| 3 | TCID Version | Null-terminated ASCII string | 30 |
| 4 | Tail ID | Null-terminated ASCII string | 8 |
| 5 | Flight Number | Null-terminated ASCII string | 10 |
| 6 | End Item Location | Null-terminated ASCII string | 8 |

3.3.4 SPECIAL INSTRUCTIONS

None.

3.3.5 ERROR CHECKING AND STATUS

OPS CM will detect the following error conditions:

1. FTP connection cannot be established or breaks during the session.
2. TCID Verify fails on the compare of files.
3. Gateway responds with a TCID Initialize failure status.
4. Gateway does not respond to a TCID Initialize command within 30 seconds.

3.3.6 COMMONALITIES

The TCID and SCID Load commands operate with the same procedures.

3.3.7 APPLICABLE STANDARDS

RFC 959 File Transfer Protocol (FTP)

3.4 ACTIVATE GATEWAY

The Activate Gateway procedure places the gateway into an operational state, allowing it to participate in computer-to-computer communications. This procedure can only be

executed after a TCID has been initialized on the gateway. The gateway responds with an Activate Gateway Status message indicating that it is ready for normal operations.

3.4.1 DATA TRANSFER MECHANISM

The Activate Gateway procedure operates as follows:

1. OPS CM transmits an Activate Gateway command to the gateway. This command is sent via CLM Reliable Multicast using the service name TBD. This moves the gateway to the Operational state.
2. Once the gateway has completed its activation, the gateway will transmit a Activate Gateway Status message to OPS CM. This message is sent via CLM Reliable Multicast using the service name TBD.

3.4.2 TIMING CONSTRAINTS

No timing constraints apply.

3.4.3 DATA FORMATS

3.4.3.1 Activate Gateway Command

The Activate Gateway command will be in the standard CLCS C-C packet format. The C-C header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------|-------|
| 1 | Payload Type (C-C type = 1) | 1 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 4 |
| 2 | Transaction ID | TR # |
| 1 | Routing Code | 8 |
| 1 | Request ID | 1 |

The C-C packet payload will contain the following data. All integer data will be in network byte order.

| Bytes | Field Description | Value |
|-------|--------------------|-------|
| 2 | Activate | 1 |
| 2 | Long Bus Polling | 0 |
| 4 | TOTAL BYTES | |

3.4.3.2 Activate Gateway Status

The Activate Gateway Status will be in the standard CLCS C-C response packet format. The response header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------------|-------------------------------|
| 1 | Payload Type (response type = 0) | 0 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 0 |
| 2 | Transaction ID | TR # |
| 2 | Transaction ID being responded to | |
| 2 | Completion Code | 0 = successful 1 = failure |

The response packet payload will contain no data.

3.4.4 SPECIAL INSTRUCTIONS

None.

3.4.5 ERROR CHECKING AND STATUS

OPS CM will detect the following error conditions:

1. Gateway responds with a Activate Gateway failure status. Under this condition the gateway moves into the SCID/TCID Load state.
2. Gateway does not respond to an Activate Gateway command within 30 seconds.

3.4.6 APPLICABLE STANDARDS

None.

3.5 DEACTIVATE GATEWAY

The Deactivate Gateway procedure places the gateway into the Ready state. This procedure can only be executed when the gateway is in the Operational state. The gateway responds with a Deactivate Gateway Status message.

3.5.1 DATA TRANSFER MECHANISM

The Deactivate Gateway procedure operates as follows:

1. OPS CM transmits an Deactivate Gateway command to the gateway. This command is sent via CLM Reliable Multicast using the service name TBD. This moves the gateway to the Ready state.
2. Once the gateway has completed its deactivation, the gateway will transmit a Deactivate Gateway Status message to OPS CM. This message is sent via CLM Reliable Multicast using the service name TBD.

3.5.2 TIMING CONSTRAINTS

No timing constraints apply.

3.5.3 DATA FORMATS

3.5.3.1 Deactivate Gateway Command

The Deactivate Gateway command will be in the standard CLCS C-C packet format. The C-C header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------|-------|
| 1 | Payload Type (C-C type = 1) | 1 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 0 |
| 2 | Transaction ID | TR # |
| 1 | Routing Code | 18 |
| 1 | Request ID | 1 |

The C-C packet payload will contain no data.

3.5.3.2 Deactivate Gateway Status

The Deactivate Gateway Status will be in the standard CLCS C-C response packet format. The response header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|----------------------------------|-------|
| 1 | Payload Type (response type = 0) | 0 |
| 1 | Flags | 0 |

| | | |
|---|-----------------------------------|-------------------------------|
| 2 | Number of bytes in payload | 0 |
| 2 | Transaction ID | TR # |
| 2 | Transaction ID being responded to | |
| 2 | Completion Code | 0 = successful 1 = failure |

The response packet payload will contain no data.

3.5.4 SPECIAL INSTRUCTIONS

None.

3.5.5 ERROR CHECKING AND STATUS

OPS CM will detect the following error conditions:

1. Gateway responds with a Deactivate Gateway failure status.
2. Gateway does not respond to an Deactivate Gateway command within 30 seconds.

3.5.6 APPLICABLE STANDARDS

None.

3.6 CONFIGURATION STATUS

The Configuration Status procedure allows OPS CM to retrieve configuration information from the gateway. This information includes version information about the SCID Build and TCID Build loaded on the gateway and the current state of the gateway. OPS CM sends a Configuration Status command to the gateway and the gateway responds with a Configuration Status message.

3.6.1 DATA TRANSFER MECHANISM

The Configuration Status Procedure operates as follows:

1. OPS CM transmits a Configuration Status command to the gateway. This command is sent via CLM Reliable Multicast using the service name, TBD.

2. The gateway responds with a Configuration Status message to OPS CM. This message is sent via CLM Reliable Multicast using the service name, TBD.

Note: The Configuration Status command is not valid when the gateway is in the SCID Initialization state.

3.6.2 TIMING CONSTRAINTS

No timing constraints apply.

3.6.3 DATA FORMATS

3.6.3.1 Configuration Status Command

The Configuration Status command will be in the standard CLCS C-C packet format. The C-C header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------|-------|
| 1 | Payload Type (C-C type = 1) | 1 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 0 |
| 2 | Transaction ID | TR # |
| 1 | Routing Code | 8 |
| 1 | Request ID | 24 |

The C-C packet payload will contain no data.

3.6.3.2 Configuration Status

The Configuration Status will be in the standard CLCS C-C response packet format. The response header fields used in this transaction will contain the following values. **Note: The remaining header fields will be set to zero.**

| Bytes | Field Description | Value |
|-------|-----------------------------------|-------------------------------|
| 1 | Payload Type (response type = 0) | 0 |
| 1 | Flags | 0 |
| 2 | Number of bytes in payload | 1-61 |
| 2 | Transaction ID | TR # |
| 2 | Transaction ID being responded to | |
| 2 | Completion Code | 0 = successful 1 = failure |

The response packet payload will contain the following data. All integer data will be in network byte order.

| Bytes | Field Description | Value |
|-------|-----------------------------------|---|
| 1 | Gateway State | 0 = SCID initialization 1 = SCID/TCID Load 2 = ready 3 = operational |
| <= 30 | Null-terminated SCID Version Name | ASCII string |
| <= 30 | Null-terminated TCID Version Name | ASCII string |
| <= 61 | TOTAL BYTES | |

3.6.4 SPECIAL INSTRUCTIONS

None.

3.6.5 ERROR CHECKING AND STATUS

OPS CM will detect the following error conditions:

1. Gateway does not respond to an Configuration Status command within 5 seconds.

3.6.6 COMMONALITIES

None.

3.6.7 APPLICABLE STANDARDS

None.

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APPENDIX A – ACRONYMS

| | |
|--------|--|
| ACK | Acknowledgment |
| API | Application Programming Interface |
| CLCS | Checkout and Launch Control System |
| CLM | Connectionless Messaging |
| CMD | Command |
| CSCI | Computer Software Configuration Item |
| FTP | File Transfer Protocol |
| GW | Gateway |
| IDD | Interface Definition Document |
| Init | Initialize |
| KSC | Kennedy Space Center |
| NASA | National Aeronautical Space Administration |
| OPS CM | Operations Configuration Manager |
| RFC | Request For Comment |
| RTCN | Real Time Critical Network |
| SCID | System Configuration Identifier |
| TBD | To Be Determined |
| TCID | Test Configuration Identifier |

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